ICAO COMMITTEE ON AVIATION ENVIRONMENTAL PROTECTION

ENVIRONMENTAL TECHNICAL MANUAL ON THE USE OF PROCEDURES IN THE NOISE CERTIFICATION OF AIRCRAFT

WORKING GROUPS APPROVED REVISION

WGAR 7
Date?

ICAO ENVIRONMENTAL TECHNICAL MANUAL ON THE USE OF PROCEDURES IN THE NOISE CERTIFICATION OF AIRCRAFT

This working groups' approved revision includes material which has been approved by the relevant Working Groups of the ICAO Committee on Aviation Environmental Protection (CAEP). Its purpose is to make available new information to certificating authorities, noise certification applicants and other interested parties as soon as it has been agreed by the working groups, therefore eliminating the delay which would otherwise occur should its publication be limited only to post CAEP meetings. Prior to these meetings the then current approved revision will be reviewed for submission to CAEP for formal endorsement and subsequent publication by ICAO.

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NOMENCLATURE

Symbols and abbreviations employed in this manual are consistent with those contained in ICAO Annex 16, Volume 1, Third Edition, July 1993.

Symbol	Unit	Description
c	m/s	Speed of sound
CI	dB	90 per cent Confidence interval in decibel units relevant to the calculation being made.
D	m	Jet nozzle diameter based on total nozzle exit area.
EPNL	EPNdB	Effective Perceived Noise Level
F	N	Engine net thrust
f	Hz	1/3-octave band centre frequency
ICD	-	Inflow control device
K	-	Constant
L	dBA	'A' - weighted sound pressure level
M	-	Mach number
M_H	-	Propeller helical tip Mach number
MAP	in. Hg	Manifold air pressure
N_P	rpm	Propeller rotational speed
N_1	rpm	Low pressure rotor speed of turbine engines
OASPL	dB	Overall Sound Pressure Level
PNL	PNdB	Perceived Noise Level
PNLT	TPNdB	Tone Corrected Perceived Noise Level
PNLTM	TPNdB	Maximum Tone Corrected Perceived Noise Level
S	-	Strouhal number (fD/V_j)
SHP	kW	Shaft horse power
SPL	dB	Sound pressure level based on a reference of 20 μPa
TCL	°C	Air temperature at engine centreline height
TMIC	°C	Air temperature at the ground plane microphone height
V_j	m/sec	Jet velocity for complete isentropic expansion to ambient pressure
V	m/sec	Aircraft airspeed
V_y	m/sec	Aircraft best rate of climb speed
WCL	Km/h	Average wind speed at engine centreline height
x	m	Distance downstream from nozzle exit
δ_{amb}	-	Ratio of absolute static pressure of the ambient air at the height of the aeroplane to ISA air pressure at mean sea level (i.e. 101.325 kPa)
θ_{t2}	-	Ratio of absolute static temperature of the air at the height of the aeroplane to the absolute temperature of the air at sea level for ISA conditions (i.e. 288.15 °K)
μ	-	Engine power related parameter, or mean value see Appendix 1
λ	degrees	Angle between the flight path in the direction of flight and a straight line connecting the aeroplane and the microphone at the time of sound emission
σ	-	Ratio of atmospheric air density at altitude to that at sea level for ISA conditions

Suffices

flt	Quantity related to flight conditions
max	Maximum value
ref	Quantity related to reference conditions
static	Quantity related to static conditions
test	Quantity related to test conditions
DOP	Doppler related quantity

Abbreviations

ESDU	Engineering Sciences Data Unit
ISA	International Standard Atmosphere
NPD	Noise-power-distance
SAE AIR	Society of Automotive Engineers - Aerospace Information Report
SAE ARP	Society of Automotive Engineers - Aerospace Recommended Practice

Notes: Where log is used in this document it denotes logarithm to the base of 10.